

What is claimed:

1. A touchscreen, comprising:

a substrate capable of propagating acoustic waves, the substrate having a touch-sensitive area; and

5 an array of acoustically reflective elements lying in or on the substrate, the array having an axis, the reflective array elements positioned at an angle relative to the array axis to transmit or receive acoustic signals into or out of the touch-sensitive area, the reflective array elements having a focusing shape.

10 2. The touchscreen of claim 1, at least one reflective array element located on a surface of the substrate.

3. The touchscreen of claim 1, at least one reflective array element at least partially embedded in the substrate.

15 4. The touchscreen of claim 1, at least one reflective array element having a varying width dimension, with a maximum width proximate its center.

5. The touchscreen of claim 1, at least one reflective array element having a varying  
20 height dimension, with a maximum height proximate its center.

6. The touchscreen of claim 1, at least one reflective array element having both of a varying width dimension and a varying height dimension, with a maximum width and a maximum height proximate its center.

5 7. The touchscreen of claim 1, at least one reflective array element comprising a groove having a varying depth in a surface of the substrate, with a maximum depth proximate its center.

8. The touchscreen of claim 7, the substrate comprising a first medium, the groove  
10 being at least partially filled with a second medium.

9. The touchscreen of claim 1, at least one reflective array element having a parabolic profile.

15 10. The touchscreen of claim 9, each of the at least one reflective array element having respective proximal facing and distal facing convex surfaces.

11. The touchscreen of claim 1, at least one reflective array element having a tapered profile.

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12. The touchscreen of claim 1, further comprising a waveguide core substantially aligned with the array axis.

13. The touchscreen of claim 12, the reflective array elements overlaying the waveguide core.

5 14. The touchscreen of claim 12, the reflective array elements underlying the waveguide core.

15. A touchscreen, comprising:

a substrate capable of propagating acoustic waves, the substrate having a touch-

10 sensitive area;

a first array of acoustically reflective elements lying in or on the substrate and positioned to transmit acoustic signals into the touch-sensitive area; and

a second array of acoustically reflective elements lying in or on the substrate and positioned to receive acoustic signals transmitted by the first array after the acoustic

15 signals have traveled across the touch-sensitive area,

at least one of the first and second reflective array elements having a focusing shape.

16. The touchscreen of claim 15, the first reflective array having a first array axis, the  
20 second reflective array having a second array axis, further comprising a first transducer acoustically coupled to the substrate and positioned to transmit an acoustic signal along

the first array axis, and a second transducer acoustically coupled to the substrate and positioned to receive an acoustic signal traveling along the second array axis.

17. The touchscreen of claim 16, one or both of the first and second transducers  
5 comprising a focusing transducer.

18. The touchscreen of claim 15, the first reflective array having a first array axis, further comprising a waveguide core substantially aligned with the first array axis.

10 19. The touchscreen of claim 15, the second reflective array having a second array axis, further comprising a waveguide core substantially aligned with the second array axis.

20. The touchscreen of claim 15, each of the first and second reflective array elements  
15 having a focusing shape.

21. The touchscreen of claim 15, each of the first and second reflective array elements having one or both of a varying width dimension and a varying height dimension, with one or both of a maximum width and a maximum height proximate its center.

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22. A touchscreen, comprising:

a substrate capable of propagating acoustic waves, the substrate having a touch-sensitive area and a border region adjacent the touch-sensitive area;

a first array of acoustically reflective elements lying in or on the substrate and positioned in a first portion of the border region for transmitting acoustic signals into the touch-sensitive area, the first array having a first array axis; and

a second array of acoustically reflective elements lying in or on the substrate and positioned in a second portion of the border region to receive acoustic signals transmitted by the first array after the acoustic signals have traveled across the touch-sensitive area, the second array having a second array axis,

the first and second reflective array elements having a focusing shape.

23. The touchscreen of claim 22, each of the first and second array elements having one or both of a varying width dimension and a varying height dimension, with one or both of a maximum width and a maximum height proximate a center of the element.

24. The touchscreen of claim 23, each of the first and second array elements having a parabolic profile.

25. The touchscreen of claim 24, further comprising a first transducer acoustically coupled to the substrate in the first portion of the border region and positioned to transmit an acoustic signal along the first array axis, and a second transducer acoustically coupled

to the substrate in the second portion of the border region and positioned to receive an acoustic signal traveling along the second array axis.